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DRAFT

Managing Nonnative Invasive Species: A CALFED Bay-Delta Program Implementation Plan for the San Francisco Bay-Delta Estuary/Sacramento-San Joaquin Rivers and Associated Watersheds

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SUMMARY

The purpose of this Nonnative Invasive Species (NIS) Implementation Plan is to provide guidance for the specific management actions necessary to address the prevention, control and impacts of nonnative invasive species that have invaded or may invade the ecosystems of the San Francisco Bay-Delta, the Sacramento/San Joaquin Rivers and their watersheds.

The primary focus of this plan will be directed at the San Francisco Bay-Delta estuary, the Sacramento-San Joaquin Rivers, the east side tributaries and the associated watersheds in California, though it is recognized that the solution area may be statewide and beyond.

The content of this plan focuses on a detailed outline of the Tasks and Actions to be accomplished in an effort to achieve the goals and address the major issues identified in the Strategic Plan.

The three goals on which the Strategic Plan and this Implementation Plan are based are as follows:

- Goal I: Preventing new introductions and establishment of NIS into the ecosystems of the San Francisco Bay-Delta, the Sacramento/San Joaquin Rivers and their watersheds.

- Goal II: Limiting the spread or, when possible and appropriate, eliminating populations of NIS through management.

- Goal III: Reducing the harmful ecological, economical, social and public health impacts resulting from infestation of NIS through appropriate mitigation.

Program implementation will be guided by the Implementation Plan. The plan focuses on the early period of implementation when needed actions are better known, but also provides a long-term vision for continuing implementation for future years. Adaptive management will adjust future implementation to accommodate what we learn about the system and the response to the early efforts of the NIS Program. It is important to note that, as the efforts to rehabilitate the estuary progress, they should include the establishment and stewardship of native populations.

Contributing to this document were the CALFED agencies and participants from academia, non-profits, stakeholder groups and individuals with technical experience

with NIS. The information contained in the Strategic Plan for the Ecosystem Restoration Program (September 30, 1998) and the draft Ecosystem Restoration Program Plan, Volume I (October 1, 1998), both CALFED Bay-Delta Program documents, provided further information for this plan. Public comments also will be solicited from local governments and regional entities, and public and private organizations that have expertise in the control of NIS. Comments will be considered and revisions made to the plan, as appropriate.

While this plan provides guidance, it does not stand alone as an instrument to deal with the problem. With this coordinated effort, California will have a more efficient approach for implementing California NIS strategies. Besides the CALFED Bay-Delta Program, California entities should find the document essential for designing projects, preparing proposals, and prioritizing activities related to the NIS issue.

INTRODUCTION

The purpose of this implementation plan is to provide a standard approach for formulating management actions to address prevention, eradication, control and impacts of NIS that have invaded or may invade the ecosystems of the San Francisco Bay-Delta estuary, the Sacramento/San Joaquin Rivers and their watersheds. This plan will serve as a basic model for resource managers responsible for implementing programs to protect and restore natural and modified ecosystems in California.

The primary focus of this plan will be directed at the San Francisco Bay-Delta estuary/Sacramento-San Joaquin Rivers and associated watersheds in California, though actions may be identified that need to be taken on a statewide basis.

In May 1995, the CALFED Bay-Delta Program was established to restore the ecological health and improve water management for beneficial uses in the Bay-Delta system. The mission of CALFED is: to develop a long-term, comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. CALFED addresses problems in four resource areas: ecosystem quality, water quality, levee system integrity and water supply reliability. The Nonnative Invasive Species Program has been developed under the Ecosystem Quality, Ecosystem Restoration Program, though we recognize that NIS negatively impact all of the CALFED resources areas.

Goal for Ecosystem Quality: The goal for ecosystem quality is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta system to support sustainable populations of diverse and valuable plant and animal species. To accomplish this, a draft Ecosystem Restoration Program Plan has been developed with goals to increase aquatic and terrestrial habitats, improve ecosystem functions and reduce the effects of stressors which included non-native invasive species. Management actions of this Implementation Plan will be consistent with the objectives identified in the **Strategic Plan for Ecosystem Restoration Program** (ERP) dated September 30, 1998. Goal 5 of that plan is "Prevent establishment of additional nonnative invasive species and reduce the negative biological and economic impacts of established nonnative species." The objectives identified under this goal are:

Objective 1: Eliminate further introductions of new species in ballast water of ships.

Objective 2: Eliminate the use of imported marine baits.

Objective 3: Halt the introduction of freshwater bait organisms into the waters of Central California.

Objective 4: Halt the deliberate introduction and spread of potentially harmful species of fish and other aquatic organisms in the Bay-Delta and the Central Valley.

Objective 5: Halt the release of fish and other organisms from aquaculture operations into Central California waters, especially those imported from other regions.

Objective 6: Halt the introduction of invasive aquatic and terrestrial plants into Central California.

Objective 7: Halt the release and spread of aquatic organisms from the aquarium and pet trades into the waters of Central California.

Objective 8: Reduce the impacts of exotic mammals on native birds and mammals.

Objective 9: Develop focused control efforts on those introduced species for which control is most feasible and of greatest benefit.

Objective 10: Prevent the invasion of the zebra mussel into California.

THE MISSION OF THE CALFED NON-NATIVE INVASIVE SPECIES PROGRAM: Prevent establishment of additional non-native species and reduce the negative biological and economic impacts of established non-native species.

The three goals on which this implementation plan is based are as follows:

- **Goal I: Preventing new introductions of NIS into the ecosystems of the San Francisco Bay-Delta, the Sacramento/San Joaquin rivers and their watersheds.**

- **Goal II: Limiting the spread or, when possible and appropriate, eliminating populations of NIS through management.**

- **Goal III: Reducing the harmful ecological, economical, social and public health impacts resulting from infestation of NIS through appropriate management.**

In development of the outline approach of this plan, it is recognized that prevention is the most practical, economic and environmentally safe method for dealing with new or incipient infestations. For NIS already widely established and distributed, this plan emphasizes an ecosystem approach utilizing integrated pest management methods that are flexible and environmentally sound. The long-term benefits of control or eradication must justify the short-term impacts. Supported research and information/awareness is critical toward maintaining a long-term control or containment program.

In order to achieve the goals set forth in this plan for NIS, a number of major issues must be addressed. These issues are critical to the establishment of a successful program. These issues are:

I. Leadership, Authority and Organization

II. Coordination, Cooperation and Partnership

III. Education and Outreach

IV. Funding and Resources

V. Monitoring, Mapping , Assessment

VI. Research

VII. Technology and Information Transfer

VIII. Enforcement and Compliance

IX. Program Evaluation

Implementation:

Implementation plans developed in accordance with this strategic management plan should address the issues that pertain in a manner that identifies the who, what, when, where, and how for the proposed tasks or actions. This CALFED NIS Implementation Plan will develop objectives from each of the major issues identified above for each of the three goals of the NIS Strategic Plan. The Implementation Plan will develop and expand detailed Tasks and Activities necessary to address the major issues and achieve the three goals.

Funding for this program has been provided through CALFED to the U.S. Fish and Wildlife Service in the amount of $1.25 million with fiscal year 1998 funds. The Service has agreed to develop and coordinate the development of a long-term Strategic Plan, an Implementation Plan and fund projects through three possible processes with this funding:

Directed projects
Expansion or extension of existing projects
Proposal solicitation process

It is anticipated that at least $1.05 million will be available for actual on-the-ground work when the planning process is complete. The funding time period for funds already committed to this program is through fiscal year 2000. It is anticipated that this plan will continue to be supported and implemented through the continued contributions and support of the various agencies and entities responsible for rehabilitation of the San Francisco Bay-Delta, the Sacramento/San Joaquin rivers and their watersheds.

MAJOR ISSUES

As presented, there are a number of major issues critical to achieving the goals as presented in this plan. These issues are discussed below and will be addressed as objectives of the Implementation Plan with specific Tasks and Actions.

California natural and man made water conveyance and impoundment systems are available and utilized for multiple purposes. In addition, there is a complex mosaic of federal, state and local laws and regulations which not only address intended use of these resources but will impact efforts to prevent the introduction, establishment and management of NIS. To facilitate accomplishment of the strategic goals, this program must coordinate with jurisdictions outside the state and build its tasks upon sound science. Therefore, mechanisms will be established to ensure that all prevention, control and abatement tasks developed and implemented by this program under this plan are (1) done so in cooperation with federal agencies, local governments, interjurisdictional organizations and other entities, as appropriate (2) based upon the best scientific information available, and (3) conducted in an environmentally-sound and conscientious manner and (4) coordinated through an interagency advisory council that will monitor management efforts and assure effective coordination of this program with CALFED, Comprehensive Assessment, Monitoring and Research Program (CMARP) and other NIS programs.

LEADERSHIP, AUTHORITY AND ORGANIZATION

As the program develops, one of the components essential to actual implementation will be to identify the leadership, authority and organization that is necessary to accomplish each of our goals. In some cases, there will be existing organizations that have the leadership and authority to carry out the actions identified in the plan. It may be that other tasks and actions determined to be essential to the success of the program do not have the leadership, authority or organization in place. In these instances, we will work to identify and/or develop the appropriate component needed to carry out the work as a part of this planning process. The formation of an interagency advisory council to monitor management efforts and assure effective coordination of this program with CALFED and other NIS programs is essential to the success of these efforts. This council will be referred to hereafter as the Nonnative Invasive Species Advisory Council (NISAC).

COORDINATION, COOPERATION AND PARTNERSHIP

In all of the work undertaken as part of this program, the value and necessity of the elements of coordination, cooperation and partnership to the success of the program can not be overstated. At all times and in all aspects of the work, priority will be given to these ideals and we will strive to incorporate them into every aspect of the plans made and actions taken.

EDUCATION AND OUTREACH

A comprehensive awareness and education program is critical for an effective NIS management program. Except for isolated cases that have attracted substantial media attention, the general public does not understand how NIS negatively impact the environment, the economy and the utilization of the natural aquatic resources that are important to them. Therefore, a strategic approach to NIS must include education and awareness component for all actions and tasks presented. Developing and implementing a coordinated and comprehensive information program will expand understanding by all California citizens of the impacts and risks associated with the introduction and spread of NIS.

Information about the nature, characteristics and the impacts of NIS on the environment, economy and quality of life needs to be made more available. This information should be presented concurrently with information about related issues such as threatened and native species, natural history, endangered species, water quality, habitat restoration, and ecosystem health. An important aspect of this program will be developing outreach to inform and educate public and private entities that may be affected by project actions. The need for understanding and managing NIS should be institutionalized in public and environmental education curricula. A well-coordinated effort is needed because of the costs and complexities associated with developing and delivering a comprehensive, high caliber outreach program.

A successful education and information program must utilize individuals and institutions with expertise on how to raise public awareness and influence attitudes towards NIS management. Public information specialists can be utilized to develop distribute and coordinate information state-wide. In addition, information specialists can enhance public interest and improve citizen and organizational involvement toward reducing the spread of NIS. Raising awareness can be achieved via television spots, ad campaigns and public service announcements. All of these efforts will make extensive use of existing agencies and pursue cost-effective strategies.

An increased awareness and concern of California citizens should precipitate an increase in level of commitment by elected officials toward NIS management. Many federal and state legislators have little understanding of the risks associated with NIS and this has had a negative impact on obtaining sufficient long term funding. An immediate priority should be the development of briefing packages and presentations for national, state, and local official and interest groups.

FUNDING AND RESOURCES

Reliable consistent funding in California for management of NIS is generally fragmented and in many cases inadequate or nonexistent. This is especially true in areas of exclusion, education, emergency response, research and management. Funds are generally available on a reactive basis and do not effectively deal with infestations before they become unmanageable. Except for the Hydrilla Program conducted by California Department of Food and Agriculture, or the Northern Pike Program conducted by California Department of Fish and Game, funds for NIS are provided after the problems become widespread. Generally these funds provide resources for limited control efforts and do very little to prevent further spread to uninfested areas.

Costs associated with this management plan and associated implementation plans must be identified. Once costs are determined, sources of revenue should be investigated and pursued. Traditional sources include but are not limited to the US Fish and Wildlife Service, ANS Task Force, US Army Corps of Engineers, US Environmental Protection Agency, Natural Resource Conservation Service and the National Fish and Wildlife Foundation. For federal agencies, allocations of discretionary funds may be necessary if dedicated funding by decision makers (Congress) can not be achieved. At the state level, one or more agencies may have to submit Budget Change Proposals to obtain long term funding in support of a statewide management program.

In addition to traditional funding sources, a working group within the NISAC, should develop a number of nontraditional funding options for NISAC consideration and recommendation. These funding options should recognize that management of NIS benefits all Californians and will actually prove cost-effective over the long term. It should not tax or levy fees in a manner that unfairly impacts one, two or three user groups. In other words, a balance between general fund revenue and user group revenue should be achieved.

Other nontraditional source of revenue and resources involve cooperative agreements and partnerships. Federal, state, local agencies and private organizations with NIS management responsibilities will be encouraged to coordinate, share or pool resources. This can include shared purchase of supplies

and use of equipment, use of staff and other human resources, sharing of mapping and monitoring data and expertise and to achieve potential purchase savings for bulk purchases of chemical supplies, biological control and educational materials.

MONITORING, MAPPING AND ASSESSMENT

Ecosystems infested with NIS are not consistently identified and delineated. Complete up to date maps, displaying the distribution and severity of NIS infestation are available only in a few areas. Knowledge of which species are located where is paramount for: 1) increasing public awareness and concern, 2) obtaining support and funding for developing a strategic program, 3) accurately predicting where new infestation may occur from already infested areas and, 4) developing effective integrated management and prevention plans with specific actions to mitigate or prevent impacts caused by NIS, 5) Establishing the costs of eradication/control efforts.

As part of the CALFED program, a Comprehensive Assessment, Monitoring and Research Program (CMARP) is under development to address the needs of CALFED's common programs and related agency programs. The CALFED NIS Program will communicate and coordinate with CMARP programs and activities.

An ecosystem inventory, mapping and monitoring system should be based on standards which allow for easy exchange of information among federal, state and local agencies as well as private organizations. Compatible systems and software will be utilized and GIS will be integrated into this process.

RESEARCH AND TECHNOLOGY TRANSFER

A strong commitment to research and information/technology transfer is critical towards achieving the goals presented in this management plan. A working group with NISAC should review research needs already developed by various entities, identify new areas of research relative to the various actions and tasks presented in the plan, prioritize areas of research and opportunities for funding and submit a report to NISAC. This should be done on at least an annual basis. This commitment also extends to the transfer of information developed to a wide audience through many venues to assure coordination and cooperation with others involved in the same type of endeavors.

ENFORCEMENT AND COMPLIANCE

In those areas where enforcement and compliance are identified as an issue, this program will develop the information base to illustrate and define the issue and

possible approaches and make recommendations to appropriate agencies to enhance the adherence to regulations.

PROGRAM EVALUATION

To be effective and responsive this management program and associated implementation plans must include an evaluation component to identify progress, evaluate implementation problem/needs and make necessary corrections at anytime. The adaptive management strategy will be highlighted. The evaluation process will include:

1. Establishment of an evaluation subcommittee within NISAC responsible for reviewing performance measures, conducting the evaluation efforts, reporting the results to NISAC and others if required, and identifying program or plan adjustments that address projected outcomes.

2. The three program goals, as previously presented, provide the focal point for evaluation. Ways to assign measurable objectives to these goals should be developed to provide meaningful evaluation.

3. The evaluation process should be inclusive, involving those with implementation responsibility, resource user groups and others affected by the program and/or plan implementation.

4. An annual report highlighting progress and achievements will be prepared and distributed. The annual report will include evaluation of the efficacy of the programs strategies and tasks and identify revisions as needed. The annual report will be readily available on the Internet and distributed to local and federal agency and legislative decision makers.

5. Work with CALFED program managers to evaluate the NIS component/impact to their program actions and how NIS may affect the overall goal of the program.

6. Work with CALFED management through CMARP to provide NIS information as it applies to management decisions.

Implementation

The three goals of the CALFED Nonnative Invasive Species Program are:

Goal I: Preventing new introductions and establishment of NIS into the ecosystems of the San Francisco Bay-Delta, the Sacramento/San Joaquin Rivers and their watersheds.

Goal II: Limiting the spread or, when possible and appropriate, eliminating populations of NIS through management actions.

Goal III: Reducing the harmful ecological, economical, social and public health impacts resulting from infestation of NIS through appropriate mitigation.

The **Objectives** that follow are identified beginning on page 8 of this document and within the draft NIS Strategic Plan as **Major Issues** of concern for the NIS Program. Under each **Objective**, specific **Actions** and **Tasks** have been identified which are considered essential elements of the implementation of this program.

Objective 1: Leadership, authority and organization
Develop and identify the leadership, authority and organization necessary to predict, prevent and reduce the impacts of NIS introductions in the ecosystems of the San Francisco Bay-Delta, the Sacramento/San Joaquin Rivers and their watersheds.

Action 1A: Form an Interagency Nonnative Invasive Species Advisory Council (NISAC) to develop the leadership, authority and organization necessary to effectively promote the NIS goals.

1. NISAC will coordinate and streamline the authorities to regulate NIS between state and federal agencies. Specific problems will be identified and pathways evaluated.
2. NISAC will develop and analyze information and recommendations to go to CALFED and program elements specific to areas of CALFED concern.
    A. NIS Technical Review Team assist with preparation of requests for proposals and coordinate peer review of proposal solicitation responses and evaluate the potential of the action in encouraging the establishment of NIS.
    B. Provide information for CALFED management decisions on the prevention NIS introductions
    C. Develop interface with CMARP for information exchange and coordination aimed at the prevention of the introduction of NIS.
3. Develop Rapid Response Plan to address early infestations of NIS.
4. Develop and implement standard reporting procedures for NIS.

5. NISAC will develop the resources necessary to carry on the council activities beyond FY 2000.

Action 1B: Identify existing authorities, leadership and areas which could benefit from further support and leadership and link this information to CALFED actions and management decisions. In particular, identify those with the authority to prevent the introduction of species through:

Ballast water releases
Bait use (marine and freshwater)
Deliberate introductions
Aquaculture releases
Aquarium and pet trades
Water features industry
Landscape and nursery industry
Urban forestry
Urban entomology
Road/Highway construction/repair/mitigation
Animal feeds
Off-road vehicles
Boating practices

1. Identify existing species specific workgroups and authorities of NIS not yet present in the CALFED area and work with those groups to determine if that species presents a threat to reaching CALFED areas of concern. Work with those groups to determine measures which can prevent the introduction of the species into the CALFED study area.

Action 1C: Identify gaps in existing authorities that would affect CALFED interests and coordinate with appropriate bodies to meet CALFED needs.

Action 1D: Develop and implement a program to systematically apply available resources to the support of viable regulations and authorities to prevent introductions of NIS.

1. Support improvements to exclusionary activities (ballast management, clean lists and border station programs).
2. Support efforts to designate ballast water as a pollutant to be regulated under existing state law (regarding the release of point source pollution and the uptake of ballast in infested waters.)
3. Recommend and provide protocols for improved detention and quarantine procedures (Cargo, packing materials, dredge spoils)
4. Review and make recommendations to improve routine inspections programs and processes of entities that may transfer NIS such as:

Retail outlets
Commodity transfers

Commercial activities
Public Venues
Irrigation districts

Action 1E: Utilize a technical working group within NISAC to review and recommend statutory and regulatory changes for state legislation to limit spread, prioritize control strategies and evaluate approaches that may limit spread of NIS.

Action 1F: Identify the organization(s) with the expertise and experience necessary to implement control strategies for NIS.

Action 1G: Develop a process through NISAC to review, recommend and coordinate control and management plans.

Action 1H: Provide a forum for CMARP, CALFED program managers, and stakeholders to discuss CALFED actions and the possibility of these actions encouraging the establishment or spread of NIS. Facilitated discussions of project or action modification to avoid encouraging NIS establishment will be part of the forum. Relate the impacts of NIS on CALFED actions and facilitate discussions of methods of reducing or eliminating the NIS impacts.

Action 1I: Establish interjurisdictional approaches to facilitate legislative, regulatory and other actions to prevent NIS introductions.

1. Pacific States Fisheries Legislative Task Force
2. Pacific States Marine Fisheries Commission

Objective 2: Coordination, cooperation and partnership
Establish and support coalitions and interjurisdictional approaches to facilitate partnership, coordination and cooperation in the efforts to prevent NIS introductions, control NIS populations and reduce their negative impacts.

Action 2A: NISAC will monitor NIS management efforts and assure effective coordination between CALFED and other NIS programs.

Action 2B: Develop partnerships with regional and national programs to facilitate the recognition of NIS threatening to spread to CALFED solution area such as:

1. Western Regional Panel
2. Aquatic Nuisance Species Task Force
3. National and California Sea Grant
4. Pacific States Marine Fisheries Commission

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5. Invasive Species Council
6. Water agencies, including NAQA, etc.
7. California Interagency Noxious Weed Coordinating Committee
8. California Exotic Pest Plant Council
9. Grassroots organizations
10. Irrigation districts
11. University of California Cooperative Extension
12. Pacific Ballast Water Group
13. Weed Management Areas

Action 2C: Initiate and maintain a communication network of NIS scientists and resource managers via NISAC and the work teams to encourage information exchange and coordination of effort.

Action 2D: Establish and support interjurisdictional process to ensure compatibility and consistency between western states and between states, public, private and semi-public agencies and federal agencies. (Federal consistency, a tool implemented by coastal management programs to ensure that federal activities/projects are compatible with enforceable policies of the state, is recommended to facilitate interjurisdictional endeavors.)

Action 2E: Establish and support coalitions among the western states including agricultural, natural resource agencies, state universities, the Coastal State Organization, coastal managers, tribal groups, recreational boaters, nurserymen, pet industry, angler groups and other concerned resource users. Assist coalitions in promoting state and federal legislation and programmatic support for the prevention of new NIS introductions or the spread of existing populations that could impact CALFED objectives.

Action 2F: Implement a watershed approach as a basic organizational structure limiting the spread of NIS but with the understanding that current water transport facilities and modes of transportation transcends traditional watershed patterns of distribution.

1. Establish cooperative policies with counties (and other entities) sharing watersheds and water transport facilities to limit the spread of NIS.
2. Establish a network of coastal counties and regional interests sharing coastal access to limit the spread of NIS.

Action 2G: Establish and maintain cooperative relationships with groups working to limit spread of NIS and work to coordinate and complement those efforts.

1. Team Arundo

2. Spartina Technical Control Committee
3. Department of Food and Ag (Hydrilla program and others)
4. Boating and Waterways (Egeria, Hyacinth and others)
5. ANS Task Force European Green Crab Workgroup
6. IEP Chinese mitten crab Project Work Team
7. Pacific Ballast Water Group

Action 2H: Support and enhance the operations and projects of the organizations responsible for ongoing programs to prevent, mitigate, control, or eradicate NIS populations.

Objective 3: Education and Outreach
Develop and implement a coordinated and comprehensive information and education program to expand the understanding of the benefits of prevention, the risks and impacts associated with introduction and spread of NIS, control strategies, associated environmental impacts and the possible modification of human behavior and activities that may reduce harmful impacts.

Action 3A: Provide the most up to date information in a format useful in CALFED management and program decisions:

1. Develop for CALFED managerial use, fact sheets on life history, environmental, economic impacts and preventative measures, etc for species that threaten to establish in the CALFED area of concern. The information on this sheet is more specific than those for general public distribution.
2. Provide a quarterly newsletter on potential NIS introductions, range distribution changes, unexpected beneficial and detrimental impacts of NIS, etc. The target audience will be CALFED managers and those making policy decisions for the CALFED program.

Action 3B: Acquire or develop and distribute appropriate information to educate and inform appropriate resource user groups about NIS and their harmful impacts in cooperation with existing resources.

1. Develop a CALFED NIS webpage to educate the resource users and the public about introductions.
2. Create NIS exhibits and supply materials to public facilities interpretive displays such as state parks, boat launches, the DWR State Water Project visitors centers, and public libraries.
3. Include information in boater registration mailer.
4. Utilize existing environmental and resource newsletters and other educational materials to publish and publicize appropriate NIS information.

Action 3C: Acquire or develop and distribute appropriate information to educate and inform appropriate businesses and other entities that may contribute to the introduction, establishment and spread of NIS.

1. Work with business and industry involved in the development of new technologies to reduce the transfer and movement of NIS.
2. Identify methods to prevent inadvertent "hitchhiking" of NIS during transport of commercial products.
3. Promote the use and inspection of packaging materials to reduce transport of NIS.
4. Acquire or develop and distribute Best Management Practices and regulation and compliance information to reduce the risk of activities which contribute to the introduction, establishment or spread of NIS. Such businesses and entities include:
    - Fishing (sport and commercial)
    - Live Seafood Dealers/ Sellers
    - Pet Stores
    - Nursery industry
    - Bait Dealers/Sellers
    - Aquatic Plant Distributors
    - Aquascape/Landscape Designers
    - Public venues (aquariums, zoos, botanical gardens)
    - Aquaculture operations
5. Distribute information on regulations and enforcement that may apply to activities that contribute to introduction of NIS.
    - Immigration
    - Customs
    - Military

Action 3D: Acquire from partners or develop and distribute appropriate information to educate and inform the public about NIS and their harmful impacts.

1. Participate in and support the 100th Meridian Initiative to prevent the westward spread of zebra mussels.
2. Promote and utilize existing public education materials such as the zebra mussel traveling trunk.
3. Support development of materials specifically designed to educate the public about the hazards of intentional/accidental introduction in cooperation with other outreach efforts and organizations like UC Cooperative Extension.
    - A. Aquaria/Pet stores
    - B. Aquatic plant/nursery
    - C. Fishermen

D. Boaters

5. Support development of a K-12 curricula in conjunction with the State Department of Education in cooperation with other interested parties such as county advisors of UC Cooperative Extension, Sea Grant.

6. Support the development and distribution of appropriate information to educate and inform the public about public health risks identified by public health agencies as associated with NIS.

Action 3E: In cooperation with other groups, develop identification materials to facilitate participation by the public and others in recognizing and reporting spread of NIS.

Action 3F: Inform and educate user groups and the public about the management strategies that are necessary to limit spread of NIS.

Action 3G: Coordinate community volunteer groups, fishermen, sport divers. Shell collectors, school groups and others in and around the Bay-Delta habitats to act as an early warning system and to communicate sightings of NIS to NISAC.

Action 3H: Develop and distribute appropriate information to educate and inform the public and appropriate resource users groups about control strategies, associated environmental impacts and the rationale for implementing such programs.

1. Utilize existing groups/programs responsible for information dissemination when appropriate and feasible such as:

UC Cooperative Extension
National and California Sea Grant
Western Regional Panel
California Exotic Plant Pest Council

Action 3I: Establish monitoring, tracking, survey programs to evaluate the effectiveness of information/education efforts.

Objective 4: Funding and Resources
Investigate, identify and develop sources of funding to support prevention activities, control efforts and actions to reduce negative impacts.

Action 4A: As information is developed about potential species that may impact CALFED actions, identify public and private entities that may also be specifically impacted by the species for program support.

Action 4B: Submit the CALFED NIS Strategic and Implementation Plan and a request for support to the ANS Task Force as a regional management plan.

Action 4C: Identify sources of Rapid Response Funds to address emergency actions taken to attack a relatively new infestation of NIS that may possibly be eradicated with early intervention.

Action 4D: Create a matrix of funding programs vs. types of NIS prevention needs.

Action 4E: Develop support for NIS prevention programs by state and federal agencies, environmental groups, academic institutions, and others.

Action 4F: Develop criteria for identifying and prioritizing funding needs both for short term rapid response and long term for more sustained funding.

Objective 5: Monitoring, mapping, and assessment
Develop and enhance monitoring and exclusion programs to prevent introductions, provide for early detections, limit spread and reduce impacts in cooperation with CMARP and other NIS programs. This objective is closely linked to Research, Objective 6.

Action 5A: Establish new and participate in and/or review existing monitoring programs to detect new introductions and detect the spread of existing populations.

1. Working with CMARP, determine how existing monitoring programs can be adjusted to detect the appearance of any new species susceptible to their sampling methods. Also determine a process of notification should a new species be detected.
2. Working with CMARP, develop species specific monitoring programs as needed to detect the appearance of a specific NIS in the CALFED area of concern. Also determine the process of notification should that species be detected.

Action 5B: Develop and recommend materials suitable to educate and train monitoring groups and field scientists in the detection and recognition of new NIS introductions.

1. Develop a list of experts for each taxonomic group.
2. Support development of appropriate keys to facilitate identifications of established and invading organisms.

Action 5C: Evaluate NIS data to develop information for CALFED Programs and managers to assist with directing CALFED actions.

Action 5D: Develop a comprehensive relational database with georeferenced data documenting habitat and landscape features as well as vector information for use with GIS to assess the distribution of likely sites for new invasions.

1. GIS system would be used in conjunction with GIS showing jurisdictional boundaries to establish authorities and permitting requirements.
2. GIS will be used to project the rate of future spread based on changing distribution patterns, habitat and landscape variables.

Action 5E: Participate with the Science Coordinating Committee of the California Biodiversity Council in cooperating on developing the links to other organizational resource databases.

Objective 6: Research
Support and coordinate scientific investigation by researchers from state and federal agencies, academic institutions, nonprofits and other organizations that address potential management strategies to prevent the introductions, limit spread and reduce the harmful impacts of NIS into the San Francisco Bay-Delta, Sacramento-San Joaquin Rivers and their watersheds.

Action 6A: In partnership with other states and federal agencies, academic institutions and environmental groups develop specific and regional listings of NIS, that have the potential to infest or spread and negatively impact the ecosystems of the CALFED solution area.

1. Utilize existing knowledge base to develop lists of NIS that represent a potential threat to invade CALFED areas of concern.
2. Utilize the above list to develop a decision-making matrix which includes the pathways, vectors, impacts, control feasibility and options of specific organisms.
3. Evaluate the matrix to determine the species most likely to arrive, least likely to be managed or controlled successfully and very likely to create a high level of negative impacts.
4. Develop a process to prioritize research needs encompassing CALFED objectives and program elements that would provide information necessary to make informed judgements about targeting species.

Action 6B: Promote support of appropriate biosystematic infrastructure, including alpha-taxonomy, genetics, maintaining collections and enhancing

expertise through the combined efforts of public agencies, universities, NGOs and other groups. Define alpha-taxonomy: species determination based on existing published morphology and anatomical characteristic and taxonomic keys.

Action 6C: Conduct or promote research on selected species that threaten to invade via state or federal research initiatives, academia, or the private sector.

1. Evaluate the potential interaction between NIS, if it were to establish, and native biota of the CALFED area of concern. (found in the CALFED Habitat Conservation Strategy). (examples *Spartina alterniflora* and *S. foliosa,* green crab *and Cancer magister)*
2. Investigate the interactions between NIS, habitat restoration efforts and CALFED activities including conveyance, etc.
3. Support research to develop information that may translate into management actions to prevent, control, limit spread or eradicate NIS. Work cooperatively with industry and stakeholders whenever possible. Such topics may include:
    - Reproductive and dispersal mechanisms
    - Viability
    - Life history
    - Suitable habitats
    - Biocontrol
    - Ecological interactions with native flora and fauna
    - Integrated pest management
    - Genetic diversity
    - Geographic origin
    - Hybridizing ability
    - Early detection technologies
    - Invasibility of Ecosystems
4. For organisms determined to be especially harmful and difficult to control, support early detection efforts and rapid response activities.
5. Whenever possible, support the development and documentation of information about NIS impacts to the food web and how those impacts may relate to efforts to revive specific populations of concern.

Action 6D: Coordinate with CMARP to support the conduct of research to investigate the establishment of beneficial, native organisms as part or restoration or rehabilitation actions. Recommend that CALFED policy include the proactive use of native species during restoration activities whenever possible.

Action 6E: Incorporate the information obtained through monitoring and research to ensure that CALFED actions do not contribute to the spread of NIS.

Action 6F: Develop/implement mitigation/control activities to reduce/eradicate populations of targeted NIS.

1. Assess physical, chemical and biological mechanisms with respect to economy, efficiency, species-specificity, efficacy, timeliness, and all associated risks/impacts.
2. Create work group with expertise on the biology of the species and with knowledge of the habitats and economic systems being impacted.
3. The work group will develop a list of control activities ranging from Rapid Response (in coordination with other Rapid Response efforts) to long term site/facility specific activities to mitigate impacts.
4. Develop list of criteria to be used to evaluate the success of the control activity as well as criteria to evaluate any negative impacts from control efforts.

Action 6G: Evaluate the economic significance of the overall impacts for NIS with respect to impacts on industrial facilities, water diversions, transportation and commerce activities, fisheries and agricultural activities, navigational needs and recreational activities, etc.

1. Develop a means of valuation of economic impacts in collaboration with economic professionals.
2. Develop a database that includes measurable economic impacts and estimated values of NIS on above activities and facilities.
3. Include this information in the matrix of Goal II, Action 6A1.
4. Based on these estimates, develop a priority ranking of economic impacts associated with different NIS.

Action 6H: Support the evaluation of the public health risks of NIS.

1. Determine the identity of species of public health interest (e.g. Cholera bacteria) likely to be coming into SF Bay or Delta.
2. Identify the vectors associated with NIS species of public health interest.
3. Develop a priority list of the most likely and the most dangerous species of public health interest based on information and recommendations developed by public health agencies.

Action 6I: Develop human behavior and activity modification recommendations wherever feasible to reduce the negative impacts of NIS.

Objective 7: Technology and Information Transfer
Ensure the availability of all information and technology developed through this program to CALFED Program managers for management and policy decisions and to other interested parties.

Action 7A: Encourage and support the publication and distribution of NIS information directly relevant to CALFED restoration activities in readily available and user friendly formats to promote informed decisions and actions.

Action 7B: Establish NIS LIST SERVE and NIS web pages on the CALFED website to facilitate information transfer with links to CMARP.

Action 7C: Encourage and support the publication of information developed through this program in appropriate and accessible media.

Action 7D: Provide regular updates of information developed through this program to organizations such as: the ANS Task Force, WRP, industries (ie aquaculture, bait), water agencies, irrigation districts, the Western Weed Coordinating committee and other interested parties.

Action 7E: In cooperation with CMARP, provide education and training for personnel responsible for monitoring to acquaint them with NIS infestations and spread potential.

Action 7F: Utilize existing technology transfer programs (such as IEP, ICE_NRPI) and when necessary, work through CMARP to develop new programs to distribute research findings and technology advances.

Objective 8: Enforcement and Compliance
Develop and support effective enforcement and compliance measures which address prevention, control/eradication and reduction of negative impacts.

Action 8A: Through NISAC, establish and encourage improved enforcement and compliance with regulations and authorities which will contribute to the prevention, control, or eradication of NIS.

Action 8B: NISAC will review existing enforcement programs and recommend improvements, changes or additional programs as needed.

Action 8C: Encourage the expansion and enhancement of the operations, responsibilities and funding of such prevention activities as the CDFA border inspection stations.

Action 8D: Inform public health agencies of NIS infestations which may have public health implications.

Action 8E: Support and enhance the operations and projects of the organizations responsible for ongoing enforcement and compliance programs to limit spread of NIS.

Objective 9: Program Evaluation
Use the adaptive management model to develop and implement an evaluation program to evaluate progress in meeting the program goals and provide feedback on problems, needs, and necessary adaptations of the implementation.

Action 9A: Evaluation program will be specified for each Action and/or Task undertaken as part of this plan.

1. The evaluation will address CALFED goals and objectives, as well as the NIS Program goals and objectives.
2. The evaluation will be inclusive, involving those with implementation responsibility, resource user groups and other affected by the program or plan implementation.

Action 9B: Convene annual workshop which includes some presentations, facilitated discussion about NIS research, management advances, and problems to evaluate current progress and future needs.

Action 9C: An annual report highlighting progress, achievements and revisions will be prepared, distributed and made available on the website

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